Unit 8
Day 4
The Discriminant

5.6 The Discriminant

Def: Discriminant- is a numerical value used to determine the number and type of solutions a quadratic equation will have.

Given a quadratic equation in $ax^2+bx+c=0$ form, then b^2-4ac is the formula used to determine the discriminant.

$$x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$$

When determining the discriminant:

If $b^2-4ac > 0$ & a perfect square, then the quadratic equation has 2 real, rational solutions.

If $b^2-4ac > 0$ & a non-perfect square, then the quadratic equation has 2 real, irrational solutions.

If $b^2-4ac < 0$, then the quadratic equation has 2 non-real (complex) solutions.

If $b^2-4ac = 0$, then the quadratic equation has 1 real, rational solution.

Find the discriminant and indicate the number and type of solutions it contains.

Ex1: $7a + 2 = 3a^2 - 6$

$3a^2 - 7a - 8 = 0$

$b^2 - 4ac$

$49 - 4(3)(-8)$

$49 + 96$

The Discriminant is 145.

2 IRRATIONAL

$a = 3$
$b = -7$
$c = -8$

Find the value of k such that the quadratic has only one solution.

Ex2: $3x^2 + kx + 6 = 0$

$a = 3 \quad b = k \quad c = 6$

$b^2 - 4ac = 0$

$k^2 - 4(3)(6) = 0$

$k^2 - 72 = 0$

$k^2 = 72$

$k = \pm\sqrt{72} = \pm 6\sqrt{2}$

$b^2 - 4ac > 0$ (+)

$b^2 - 4ac < 0$ (−)

Find an equation with the given solutions:

Ex3: $x = \{-5, \frac{1}{2}\}$

$x = -5 \quad | \quad x = \frac{1}{2}$

$x + 5 = 0 \quad | \quad 2x = 1$

$(x+5) \quad | \quad (2x-1)$

$(x+5)(2x-1) = 0$

$2x^2 + 9x - 5 = 0$

Solving Cubes:

Ex4: $x^3 - 8 = 0$

$(x-2)(x^2+2x+4) = 0$

$x - 2 = 0 \quad | \quad a = 1 \; b = 2 \; c = 4$

$x = 2$

$x = \frac{-2 \pm \sqrt{4 - 4(1)(4)}}{2}$

$x = \frac{-2 \pm \sqrt{-12}}{2}$

$x = \frac{-2 \pm 2i\sqrt{3}}{2} = -1 \pm i\sqrt{3}$

$\{2, -1+i\sqrt{3}, -1-i\sqrt{3}\}$

Solving quadratic literal equations:

Ex5: $V = \pi r^2 h$ solve for r

skip 2010

Ex6: $A = 2\pi r^2 + 2\pi rh$, Solve for r

skip 2010

HW pg 118 35,36,38, 66-72 (even), 77-80 all

Extra problems:

Find the value of k such that the quadratic has only one solution.

1) $25m^2-10m+k=0$

2) $y^2+11y+k=0$

3) $kr^2+(2k+6)r+16=0$

4) $ky^2+2(k+4)y+25=0$

Ex1: $2x^2 + 4x - 7 = 0$

Ex2: $\frac{1}{3}m^2 + \frac{1}{5}m + \frac{1}{15} = 0$

Ex3: $a^2 + a\sqrt{3} + 5 = -2$

HW pg 118-119 23-34, 39-44 all